NEW GENERA AND SUBGENERA OF MESOZOIC BIVALVIA

by L. R. COX

ABSTRACT. The following new taxa, belonging to the families stated, are diagnosed and discussed: *Palmoxytoma* subgen. nov., type species, *Pecten cygnipes* Young & Bird, Middle Lias (Oxytomidae, now advanced from subfamily to family rank); *Rhaetavicula* gen. nov., type species, *Avicula contorta* Portlock, Rhaetic (Pteriidae ?); *Ornithopecten* gen. nov., type species, *Aviculopecten bosniae* Bittner, Middle Trias (Aviculopectinidae); *Ensio* gen. nov., type species, *Ptychomya agassizii* Lycett, Bajocian (Astartidae).

THE purpose of this paper is to establish new genera for certain Mesozoic bivalves, previous generic assignments of which appear unsatisfactory, and a new subgenus of *Oxytoma* for a small and distinctive group of species belonging to this genus. It is intended to use one of the new generic names in a handbook, *British Mesozoic Fossils*, shortly to be published by the British Museum (Natural History), and all four names in the volume of the *Treatise on Invertebrate Paleontology* which is to be devoted to the Bivalvia.

The Linnean name Bivalvia was the earliest term for the molluscan class which has since become known by the alternative names Lamellibranchia or Pelecypoda. Its use is now becoming increasingly widespread and it has been adopted in several of the leading modern works of reference, including J. Thiele's *Handbuch der systematischen Weichtierkunde* (Jena, 1929–35) and F. Haas's contribution on the class in question, forming Band 3, Abt. 3 (1929–35) of the modern edition of Bronn's *Klassen und Ordnungen des Tierreichs* (Leipzig). It is expected that it will be adopted in the appropriate volume of the *Treatise*.

Acknowledgements. I must thank the authorities of the Geological Survey for the loan of the holotype and other specimens of *Ensio agassizii* together with a specimen of the little-known right valve of *Rhaetavicula contorta*. Dr. R. J. G. Savage, of Bristol University, has kindly lent three further specimens of this valve.

ERECTION OF A NEW FAMILY OXYTOMIDAE AND OF A NEW SUBGENUS

Until recently *Oxytoma*, *Meleagrinella*, *Maccoyella*, and related Mesozoic genera were included in the family Pteriidae, based on the living genus *Pteria* Scopoli, 1777 (synonym, *Avicula* Bruguière, 1791). Ichikawa (1958), however, has proposed that these genera should constitute a new subfamily Oxytominae, which he has included in the family Aviculopectinidae as extended by Newell (1938), and hence in the superfamily Pectinacea rather than in the Pteriacea. Their affinity with the Aviculopectinidae is suggested by the deep subauricular notch in the right valve and by the ornament of radial ribs and riblets which are commonly of two or three orders of strength. On the other hand, their inequilateral, prosocline form and the much reduced size of the right anterior auricle distinguish them from *Aviculopecten* itself, and Ichikawa has pointed out the important difference that the inner ostracum of the valves of their shell is calcitic, with a crossed-lamellar structure, and not aragonitic as in typical Aviculopectinidae, including *Pseudo-*

[Palaeontology, Vol. 4, Part 4, 1961, pp. 592–8.]

monotis (cf. Newell 1938, p. 92). A further difference is that the pallial line, which has been observed in *Oxytoma*, *Meleagrinella*, *Maccoyella*, and *Pseudavicula*, is discontinuous and broken up into small pits (as in Recent Pteriidae), whereas in the Aviculopectinidae it is continuous.

It is now suggested that these differences are important enough to justify the elevation of the Oxytominae to family rank as Oxytomidae. It is considered that this family was descended from the Aviculopectinidae and should be included in the superfamily Pectinacea. Certain points of resemblance to the Pteriidae are, it is thought, attributable to parallel evolution. Members of the Oxytomidae are clearly distinguished from that family by the absence of an aragonitic, nacreous inner ostracum.

Genus OXYTOMA Meek 1864

The new taxon *Palmoxytoma*, proposed below, is considered to be a subgenus of *Oxytoma*, the type species of which, by original designation, is *Avicula inuensteri* Goldfuss 1836. The generic characters of *Oxytoma* may be summarized as follows: shell suborbicular and acline to ovate or broadly lunate and prosocline; valves very unequal and commonly discordant, the left one of varying convexity with the umbo protruding, the right one flat or feebly convex; posterior wing of both valves more or less elongated, sharply pointed; left anterior wing small, obtuse; right anterior auricle small, subauricular notch deep, acute, with a ctenolium, an angular sinus of the shell margin extending on the inner side of the notch; ligamental area almost parallel with plane of commissure of valves in left valve, almost perpendicular to it in the right; no hinge teeth; left valve in most species ornamented with radial ribs or riblets.

Subgenus PALMOXYTOMA subgen. nov.

Subgeneric name. Latin *palma*, hand; *Oxytoma*, a genus of Bivalvia. Gender, feminine.

Type species. Pecten cygnipes Young & Bird (1822, p. 235, pl. 9, figs. 4, 6), Middle Lias.

Diagnosis. Large, orbicular, only slightly prosocline *Oxytoma*; left valve moderately to strongly convex, right valve almost flat; left valve with a small number (3 to about 8) of narrow, prominent, spinose ribs which give rise to projections or narrow digitations of the valve margin and are separated by broad, flat intervals which are smooth or bear fine radial striations; the ribs increasing by intercalation in some specimens; right valve with a small number of faint, narrow radial grooves and, in some specimens, fine radial striations; posterior adductor scar more nearly median than in *O.* (*Oxytoma*).

Remarks. This subgenus, distinguished from *Oxytoma* s. str. by the large size and characteristic ornament of the shell, is confined to the Lias of Europe. The known species are *O.* (*Palmoxytoma*) *longicostata* (Stutchbury) (1839, p. 163, text-fig.), from the basal Lias (Pre-Planorbis Beds of the Hettangian) of the Bristol district, *O.* (*P.*) *magnifica* (Lundgren) (1881, p. 31, pl. 5, figs. 2–5), from the Hettangian of Sweden, and the type species, which occurs in the Middle Lias (Domerian) of England, France, and Switzerland. *O.* (*P.*) *cygnipes* has also been recorded from the uppermost Lower Lias (Lower Pliensbachian, Davoei Zone) of northern Germany, but specimens from this area have not been figured. The record (Jekelius 1915, p. 56, pl. 8, fig. 12) of its occurrence in the

uppermost Lower Lias of Romania was based on small, imperfect specimens which appear to have been wrongly identified.

ERECTION OF A NEW GENUS *RHAETAVICULA* (FAMILY PTERIIDAE?)

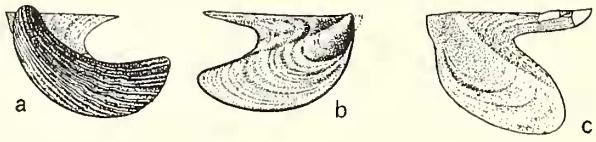
Genus RHAETAVICULA gen. nov.

Text-fig. 1

Generic name. From the geological stage name Rhaetic (derived from that of the Roman province Rhaetia or Raetia), and *avicula*, diminutive of the Latin *avis*, bird. Gender, feminine.

Type species. Avicula contorta Portlock (1843, p. 126, pl. 25A, fig. 16), Rhaetic.

Diagnosis. Small, narrow, lunate, strongly prosocline, highly inequivalve, valves probably discordant; left valve strongly convex, posteriorly upcurved, with a twisted



TEXT-FIG. 1. *Rhaetavicula contorta* (Portlock), Rhaetic. *a*, left valve (generalized), ×1·5; *b*, right valve, borehole at Stowell Park, Northleach, Glos. (Geol. Surv. Mus. no. Bj 6116), ×1·5; *c*, external impression of right valve, two small patches of shelly matter remaining on posterior wing, Emborough, Somerset (Bristol Univ. Coll. no. 549), ×3.

appearance, its margins not in one plane; left umbo narrowly rounded, protruding, anteriorly placed; right valve almost flat, probably smaller than the left; posterior wing in both valves narrow, elongate, acutely pointed, with a deep rounded sinus below it; that of the left valve flattened and well demarcated from the body; left anterior wing small; right anterior auricle small, higher than long, not separated from body of valve by a notch; ligamental area narrow; body of left valve with narrow, unevenly spaced, rounded radial ribs, a few of their intervals with a secondary radial thread; posterior wing of left valve smooth; right valve smooth or almost so; an elongate posterior lateral tooth present in left valve, presence of an anterior tooth inconstant; muscle scars not observed.

Remarks. The type species is the most characteristic fossil of the Rhaetic stage of Europe and has also been found in Burma. The specimen from New Zealand recorded as *Pteria* cf. *contorta* by C. T. Trechmann (1923, *Quart. J. geol. Soc. Lond.* **79**, p. 273, pl. 12, fig. 10) is the internal mould of a small *Oxytoma*.

At many localities the bedding planes of Rhaetic rocks are strewn with specimens of its convex left valve, but specimens of the right valve are of very rare occurrence. The only published figures of this valve are those of Pflücker (1868, pl. 7, fig. 2) and Maud Healey (1908, pl. 5, figs. 4*a*, *b*). The first author depicts a broken specimen from Germany retaining part of this valve in place. It has a short, distally rounded anterior auricle with no notch below it. The specimen figured by Healey, also associated with the

left valve, was obviously also imperfect and her figure is not very clear. She describes the anterior auricle as 'very small and convex'. An isolated right valve, represented in her fig. 6 and identified as '*Pteria* sp. ind.', probably belonged to *R. contorta* also, but, if this was the case, the auricle, represented as sharply pointed, may have been inaccurately drawn.

Dr. R. J. G. Savage has sent me three right valves, from the black Rhaetic shales of Emborough, Somerset, which can be confidently assigned to *R. contorta*. All are impressions except for a little adherent shelly matter, and one, virtually an external mould, is illustrated in text-fig. 1*c*. The valve is without ornament. The anterior auricle, seen in all three specimens, is small and high in proportion to its length, with an outer angle of about 60°. No subauricular notch is present and there is only a slight concavity of the margin of the valve where the auricle joins the body.

I have not observed hinge teeth or their impressions in any British specimens of *R. contorta*, but this is probably due to their poor state of preservation. Pflücker (1868, p. 408) spoke of a clearly visible, lamelliform ('leistenförmig') lateral tooth on the posterior wing of the left valve and of a weak anterior tooth, the impression of which was visible in some specimens from Germany but not in others.

Originally described and for long widely known as *Avicula contorta*, this species is now generally cited as *Pteria contorta*, but it could not continue indefinitely to be known by this name, as by modern taxonomic standards it cannot be considered as congeneric with the living species *Pteria hirundo* (Linnaeus), type species of *Pteria*. The strong radial ribbing and the twisted form of the left valve are obvious distinctive characters. Beyrich (1862, p. 10) remarked that the Rhaetic species belonged to his newly founded taxon *Pseudomonotis*, but Pflücker (1868, p. 409) thought that it should be included in Beyrich's other genus *Cassianella*. This view was accepted by one or two authors of the next decade but was then abandoned and the original assignation to '*Avicula*' or *Pteria* adopted. There are points of resemblance between the Rhaetic shell and the more typical species of *Oxytoma*—the nature of the radial ornament, a tendency for this to be lacking on the right valve, and the flatness of the latter. In some specimens of *Oxytoma*, moreover (for example, the one figured as *O. muensteri* (Goldfuss) by Ichikawa, 1958, pl. 24, figs. 6*a*, *b*), the shell is pronouncedly lunate in shape and is distinctly reminiscent of the Rhaetic species.

It seems, however, undesirable at present to conclude that these resemblances indicate a close relationship between *Rhaetavicula* and *Oxytoma* and the consequent reference of the former genus to the Oxytomidae. All genera which I have accepted as members of that family agree in possessing a deep byssal notch below the right anterior auricle. Such a notch, as seen above, is absent in *Rhaetavicula*, the byssus having presumably passed through a slight gape of the valves. Consideration of various genera of the Pectinidae, it is true, shows that the presence of a deep byssal notch is not necessarily a feature of family significance. Should future work on the shell structure of *Rhaetavicula* (on which at present we have no certain information) lead to the conclusion that the inner ostracum of the valves was calcitic and not aragonitic and nacreous, this fact might be considered to outweigh the objection, based on the lack of a byssal notch, to the inclusion of *Rhaetavicula* in the Oxytomidae. For the present, however, it seems advisable to be conservative in referring this genus (perhaps with a query) to the family Pteriidae, based on the genus in which its type species has been usually placed.

ERECTION OF A NEW GENUS *ORNITHOPECTEN* (FAMILY AVICULOPECTINIDAE)

Genus ORNITHOPECTEN gen. nov.

Generic name. From Greek ὄρνις, bird; *Pecten*, genus of shells.

Type species. Aviculopecten bosniae Bittner (1903, p. 592, pl. 26, figs. 16, 17), Middle Trias.

Diagnosis. Small, acline to slightly prosocline, slightly inequivalve, but with the left umbo scarcely protruding; posterior wings pointed, more or less acute, not clearly demarcated from body of shell in most species; left anterior wing and right anterior auricle relatively small, subauricular sinus shallow to moderately deep; ornament of narrow, well-separated radial riblets, any increase of which in either valve is by intercalation, and of concentric lamellae.

Remarks. This new genus is proposed for the reception of a series of species of Triassic age which have so far been included in *Aviculopecten*. The characters of this genus have been fully discussed by Newell (1938, p. 43), who has shown that *A. planoradiatus* M'Coy must be accepted as its type species. *Ornithopecten* differs from *Aviculopecten* in the relatively small size of the left anterior wing and right anterior auricle (i.e. in the more inequilateral form of the shell), and in the nature of the ornament. In the right valve of *Aviculopecten* the radial ribs increase by bifurcation, whereas in *Ornithopecten* the increase (if any occurs) is by intercalation, as in the left valve. These differences give the Triassic forms a distinctive appearance which suggests their generic separation from *Aviculopecten*.

Species referable to the new genus include, besides the type species, the following forms: *Aviculopecten aerarius* Bittner, *beneckei* Bittner, *elegantulus* Bittner, *esinensis* Bittner, *herbichi* Bittner, *interruptus* Bittner, *katzeri* Bittner, and *triadicus* Salomon, and also *Avicula wissmanni* Münster.

ERECTION OF A NEW GENUS *ENSIO* (FAMILY ASTARTIDAE)

Genus ENSIO gen. nov.

Text-fig. 2

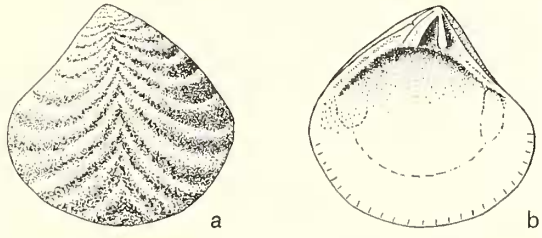
Generic name. Alluding to the ornament of chevrons, suggesting the badge of rank of an N.C.O.; gender, masculine.

Type species. Ptychomya agassizii Lycett (1850, p. 408, pl. 11, fig. 6) (synonym, *Astarte divaricata* Etheridge (in Cross 1875, p. 129, pl. 5, fig. 1)), Inferior Oolite.

Diagnosis. Small, suborbicular, some specimens with a trigonal tendency, only slightly inequilateral, compressed; umbo slightly anterior to median, not incurved; escutcheon and lunule narrow and elongate, scarcely impressed, bordered by obtuse ridges. Left valve with two rather elongate, not greatly unequal cardinal teeth diverging to either side of the beak, an acutely triangular recess between them; the anterior tooth separated from the lunular margin by a narrow groove, the posterior tooth fused with the short nymph at its umbonal end; also with a narrow posterior lateral tooth parallel with and close to the adjacent margin. Right valve with a moderately strong median cardinal and

a thin anterior lateral received in the corresponding recesses in the other valve. Ventral margin faintly denticulate internally. Ornament of rounded, chevron-shaped ridges pointing towards the umbo.

Remarks. The holotype of the type species of *Ensio*, *Ptychomya agassizii*, from the Inferior Oolite, Oolite Marl, of Nailsworth, Glos., is in the Geological Survey Museum (reg. no. 9139). A topotype is in the same Museum (no. 99256), while two further specimens from the same formation, recorded as coming from 'Stroud' but possibly also topotypes, are in the E. Witchell Collection in the British Museum (Natural



TEXT-FIG. 2. *Ensio agassizii* (Lycett), Bajocian, Santon, Lincs. Holotype of *Astarte divaricata* Etheridge (Geol. Surv. Mus., Geol. Soc. Coll. no. 7044), a left valve; exterior and interior, ×4.

History). The holotype of *Astarte divaricata*, which is undoubtedly conspecific with *Ptychomya agassizii*, came from the Lincolnshire Limestone of Santon, Lincs., and is in the Geological Survey Museum (*ex* Geological Society of London Collection, no. 7044). The species is rare and has not been found outside England.

It is interesting to note that the only other described species of *Ensio* occurs as far afield as Borneo. It is *Astarte eastonii* Vogel (1899, p. 55, pl. 3, figs. 1–8) and was found in beds considered to be Upper Jurassic in age, although the exact stage to which they belong seems still to be uncertain. This species has exactly the same type of ornament as *Ensio agassizii*, except that in one of the figured specimens the chevrons of later growth stages are interrupted by a downward V-bend in the middle. Its umbo is less prominent than in the English species.

The description in the above diagnosis of the hinge-teeth of the left valve of *Ensio* is based on the holotype of *Astarte divaricata*. No reference has, however, been made to an obscure median groove seen in the posterior cardinal of this specimen, as Vogel's (1899, pl. 3, fig. 7) figure of the teeth of the corresponding valve of *E. eastonii*, which otherwise agree well with those of the English species, does not indicate this feature. The description of the dentition of the right valve of the new genus has been based on Vogel's fig. 8. Vogel mentions and figures fine transverse striations on the sides of the cardinal tooth of the right valve and of the corresponding socket between the two cardinals of the left valve. These are not visible in the left valve of *E. agassizii*, but its interior is a little eroded.

The hinge of *Ensio* is that of a typical member of the Astartidae, and the entire pallial line and internally denticulate margins also support its reference to that family. It is interesting to find surface ornament of chevrons, like that of certain Veneridae and Lucinidae, in an astartid.

REFERENCES

BEYRICH, E. 1862. [Remarks on two *Avicula*-like shells from the German Muschelkalk.] *Z. dtsch. geol. Ges.* **14**, 9–10.

BITTNER, A. 1903. Brachiopoden und Lamellibranchiaten aus der Trias von Bosnien, Dalmatien und Venetien. *Jb. geol. Reichsanst.*, Wien, **52**, 495–642, pl. 18–27.

CROSS, J. E. 1875. The geology of north-west Lincolnshire. *Quart. J. geol. Soc. Lond.* **31**, 115–30, pl. 5. (With Appendix on fossils by R. Etheridge.)

HEALEY, MAUD 1908. The fauna of the Napeng Beds or the Rhaetic Beds of Upper Burma. *Palaeont. indica*, N.S., **2** (4), 88 pp., 9 pl.

ICHIKAWA, K. 1958. Zur Taxionomie und Phylogenie der triadischen 'Pteriidae' (Lamellibranch.). *Palaeontographica*, **111** (A), 131–212, pl. 21–24.

JEKELIUS, E. 1915. Die mesozoischen Faunen der Berge von Brassó. I. Die Liasfauna von Keresztényfalva. *Mitt. Jb. ung. geol. Reichsanst.*, Budapest, **23**, 29–113, pl. 5–8.

LUNDGREN, B. 1881. Undersökningar öfver molluskfaunan i Sveriges äldre mesozoiska bildningar. *Acta Univ. lund.* **17** (3), 57 pp., 6 pl.

LYCETT, J. 1850. Tabular view of fossil shells from the middle division of the Inferior Oolite in Gloucestershire. *Ann. Mag. nat. Hist.* (2), **6**, 401–25, pl. 11.

NEWELL, N. D. 1938. Late Paleozoic pelecypods: Pectinacea. *Univ. Kansas State geol. Surv. Kansas*, **10**, 123 pp., 20 pl.

PFLÜCKER, L. 1868. Das Räth (die Rhätische Gruppe) in der Umgegend von Göttingen. *Z. dtsch. geol. Ges.* **20**, 397–432, pl. 7.

PORTLOCK, J. E. 1843. Report on the geology of the county of Londonderry, and of parts of Tyrone and Fermanagh. xxxi+784 pp., 54 pl. *Geol. Surv. Ireland.*

STUTCHBURY, S. 1839. Description of a new fossil *Avicula*, from the Lias shale of Somersetshire. *Mag. nat. Hist.*, N.S., **3**, 163–4.

VOGEL, F. 1899. Neue Mollusken aus dem Jura von Borneo. *Samml. geol. Reichsmus., Leiden*, **6**, 40–76, pl. 1–5.

YOUNG, G., and BIRD, J. 1822. *A Geological Survey of the Yorkshire Coast*. Whitby. 235 pp., 17 pl.

L. R. COX
Department of Palaeontology,
British Museum (Natural History),
Cromwell Road,
London, S.W. 7

Manuscript received 8 March 1961